

# Flight & Flow Information for a Collaborative Environment (FF-ICE)

## A Concept to Support Future ATM Operations

### The role of FF-ICE

As a product of the ICAO Global ATM Concept, FF-ICE defines information requirements for flight planning, flow management and trajectory management and aims to be a cornerstone of the performance-based air navigation system. Flight information and associated trajectories are principal mechanisms by which ATM service delivery will meet operational requirements.

FF-ICE will have global applicability and will support all members of the ATM community to achieve strategic, pre-tactical and tactical performance management. FF-ICE emphasises the need for information sharing to enable significant benefits.

The exchange of flight/flow information will assist the construction of the best possible integrated picture of the past, present and future ATM situation. This

exchange of information enables improved decision making by the ATM actors involved in the entire duration of a flight, i.e. gate-to-gate, thus facilitating 4-D trajectory operations.

FF-ICE envisages that definitions of data elements are globally standardised and provides the mechanisms for their exchange. Thus, with appropriate information management, a Collaborative Decision Making environment is facilitated enabling the sharing of appropriate data across a wider set of participants resulting in greater coordination of the ATM community, situational awareness and the achievement of global performance targets.

The future collaborative and dynamic flight information process will involve the full spectrum of ATM Community members as envisaged in the ATM Global



Fig 1: Current ATM based on regional/state processes and targets

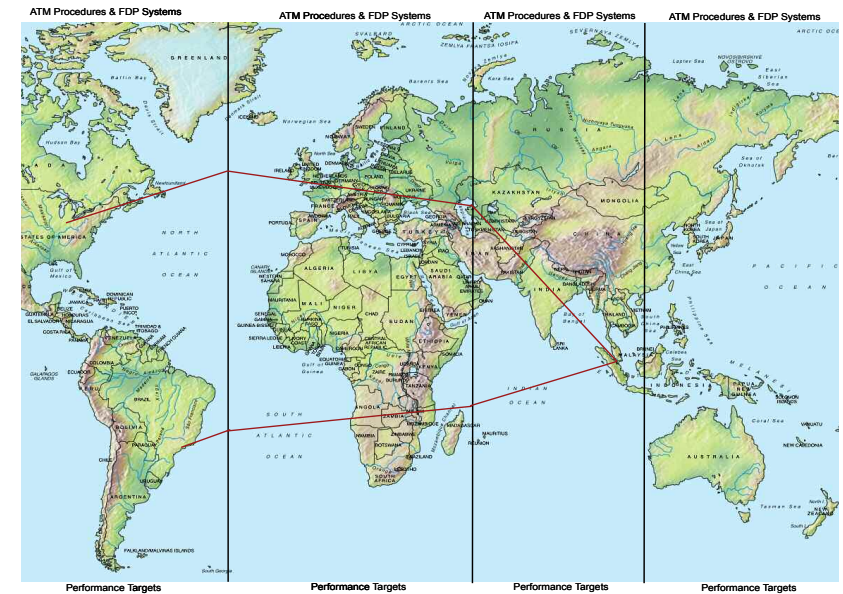
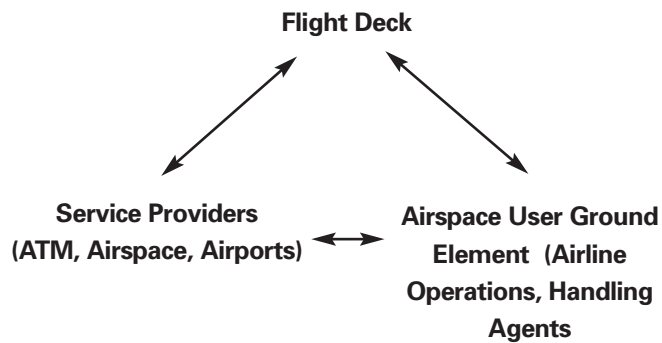


Fig 2: FF-ICE facilitated ATM based on global concepts, processes and targets



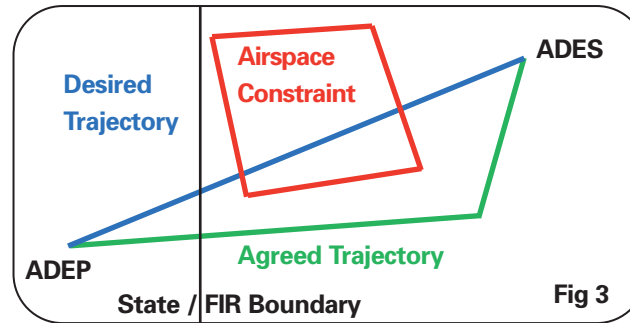
Operational Concept. The cornerstone of future air traffic management is the interaction between these various parties and FF-ICE allows dynamic exchange of information.



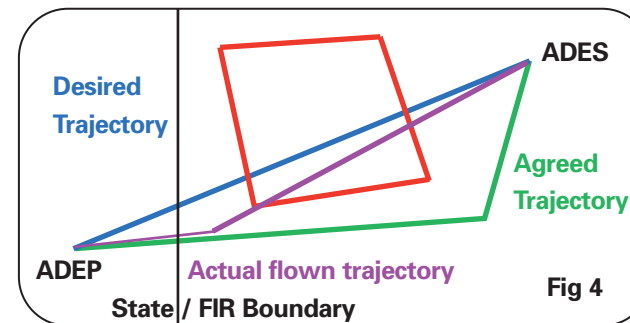
The Global ATM concept, facilitated through regional programmes such as SESAR (Single European Sky ATM Research) in Europe, NextGen (Next Generation Air Transportation System) in North America and CARATS (Collaborative Action for Renovation of Air Traffic Systems) in Japan, foresees Air Traffic Control becoming traffic management by trajectory. The roles of the parties illustrated above will evolve to support the requirements of this concept which will:

- Entail systematic sharing of aircraft trajectory data between actors in the ATM process
- Ensure that all actors have a common view of a flight and have access to the most accurate data available
- Allow operations respecting the airspace users' individual business cases

Trajectory management will be carried out both strategically and tactically as illustrated above right:



In Figure 3 above, the operator's 'desired' trajectory is not possible because airspace allocated to military use in a neighbouring State/FIR is unavailable for civil use. This is known as a constraint which can be generated by any of the participants in the ATM system. For example, the aircraft may be limited to a maximum altitude or departure from a particular airport may be limited to rigid routings for environmental reasons. As a result the 'agreed' trajectory is determined before departure so that it avoids the airspace constraint. This is commonly referred to as strategic ATM.



In Figure 4 above the military use of the airspace has finished early but after the departure of the flight concerned. Trajectory management facilitated by FF-ICE, which includes cross-border and/or inter-state information exchange, now allows the participants concerned, in this case airspace user and ATM service provider, to re-negotiate the trajectory so that the 'actual' trajectory is as close as possible to the

'desired'. This is commonly referred to as tactical ATM and relies on comprehensive information exchange between all ATM participants without State/FIR boundaries providing a constraint.

Once FF-ICE is created all interested and authorised parties will have access to all the information it contains. Mechanisms will be in place to manage information creation and updates from multiple authorised parties. Although focussing on flight and flow information, FF-ICE makes assumptions regarding interaction with other information areas such as meteorology, aeronautical information and infrastructure status. All participants are expected both to provide and utilise shared information but, for performance reasons, different data elements will be required under different circumstances, locations and times. The constant exchange of information by all parties within the overall collaborative environment is fundamental to both strategic and tactical ATM.

## The implications of FF-ICE

In support of the Global ATM Concept and subsequent regional initiatives, FF-ICE is an enabler to deliver benefits to all members of the ATM community:

- Airspace User – Greater equity in airspace access; greater access to timely and relevant information for decision support and more autonomy in decision making leading to opportunities for better delivery of business and individual objectives.
- Service Provider (including airports) – Ability to operate within an information-rich environment, with real-time data plus automated decision support and

decision making tools, to optimise the services provided to airspace users.

However, the requirement for increased amounts of information, increased numbers of participants sharing and using this information and the increased levels of collaborative decision making will require changes to the technical environment:

- Operator Systems – The collaborative process, allowing interaction with other parties and the use of shared data, will require improvements to planning and processing systems.
- Service Providers – Changes to the flight information process will require changes to data processing systems, requiring additional capabilities. Interfaces and interactions between systems will have to be addressed.
- Documentation and Training – Changes to procedures and systems will impact these areas to maximise benefits

FF-ICE will impact different members of the ATM community in different ways but aims to bring benefits to all.

## The need for change

The Global ATM Concept envisages an integrated, harmonised and globally interoperable system for all users in all phases of flight. The aim is to increase user flexibility and maximise operating efficiencies while increasing system capacity and improve safety levels in

the future ATM system. The current system, including the flight planning process, has many limitations. FF-ICE aims to establish the environment to address these limitations and to facilitate improvements such as:

- Reduced reliance on voice radio communications for air/ground links
- Increased collaborative planning amongst ATM actors
- Providing facilities for real time information exchange
- Maximising benefits of advanced equipment and encouraging deployment of improved air and/or ground systems
- Increased flexibility to permit optimum management of the ATM system through, for example, flexible use of airspace, more direct routeings, reduction in excessive system delays and aircraft operation in the most efficient performance environment
- Dynamic trajectory management

Against this background of overcoming limitations and the desire to increase operational benefits, it was necessary to significantly revise the flight planning process to support the development of a performance based ATM system. Whilst some elements of the Global ATM Concept could be addressed within existing provisions, a much broader system of Collaborative Decision Making and exchange of information is required to facilitate gate-to-gate operations in such a performance based environment.

## When will this happen?

The transition to the Collaborative Environment, of which FF-ICE is a part, is unlikely to occur on a global

scale all at once but with a phased introduction up to around 2025. The timeline for the development of FF-ICE, so that flight planning provisions can meet the evolving requirements of a future automated ATM system is as follows:

**2011 onwards** – Development of necessary standards and documentation, including implementation and transition guidance, for the full introduction of FF-ICE.

**2012** – FF-ICE Concept formally adopted at ICAO Air Navigation Conference. Interim amendment to ICAO guidelines for flight planning comes into effect to allow better representation of current technology, both ground and airborne, in the flight plan thus facilitating increased flexibility in ATM.

**2014-2020** – Implementation of elements of FF-ICE to facilitate as many early benefits as possible in support of the Global ATM Concept.

**2025** – Full implementation of FF-ICE completed by this date at the latest.

The date for full implementation seems a long way off but participants in the ATM system are encouraged to embrace the concept now and begin evaluating the impact on systems and processes so that the transition may be as seamless as possible. The introduction of a performance-based flight and flow management system should produce significant benefits in the future.